



Doodle Around the World: Online Scheduling Behavior Reflects Cultural Differences in Time Perception and Group Decision-Making

Citation

Reinecke, Katharina, Minh Khoa Nguyen, Abraham Bernstein, Michael Näf, and Krzysztof Z. Gajos. 2013. "Doodle around the world: Online scheduling behavior reflects cultural differences in time perception and group decision-making." In Proceedings of the 16th ACM Conference on Computer Supported Cooperative Work (CSCW '13), San Antonio, TX, February 23-27, ed. Amy Bruckman, Scott Counts, Cliff Lampe, Loren G. Terveen, 45-54. New York, NY: ACM Press.

Published Version

doi:10.1145/2441776.2441784

Permanent link

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:12561360>

Terms of Use

This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Open Access Policy Articles, as set forth at <http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#OAP>

Share Your Story

The Harvard community has made this article openly available.
Please share how this access benefits you. [Submit a story](#).

[Accessibility](#)

Doodle Around the World: Online Scheduling Behavior Reflects Cultural Differences in Time Perception and Group Decision-Making

Katharina Reinecke¹, Minh Khoa Nguyen², Abraham Bernstein², Michael Näf³, Krzysztof Z. Gajos¹

¹Harvard University
Cambridge, MA, USA
{reinecke,kgajos}@
seas.harvard.edu

²University of Zurich
Zurich, Switzerland
{nguyen,bernstein}@ifi.uzh.ch

³Doodle AG
Zurich, Switzerland
mn@doodle.com

ABSTRACT

Event scheduling is a group decision-making process in which social dynamics influence people's choices and the overall outcome. As a result, scheduling is not simply a matter of finding a mutually agreeable time, but a process that is shaped by social norms and values, which can highly vary between countries. To investigate the influence of national culture on people's scheduling behavior we analyzed more than 1.5 million Doodle date/time polls from 211 countries. We found strong correlations between characteristics of national culture and several behavioral phenomena, such as that poll participants from collectivist countries respond earlier, agree to fewer options but find more consensus than predominantly individualist societies. Our study provides empirical evidence of behavioral differences in group decision-making and time perception with implications for cross-cultural collaborative work.

Author Keywords

Doodle, event scheduling, cross-cultural, decision-making

ACM Classification Keywords

H.5.3 Group and Organization Interfaces:
Computer-supported cooperative work

INTRODUCTION

It might not be surprising that the origin of the popular event scheduling tool Doodle [11] lies in Switzerland—the country of accurate clocks and “Swiss efficiency”. Doodle addresses the problem of deciding on a mutually agreeable time by letting users create polls with several date and time options. After participants indicate their availability, poll initiators can easily determine the best time for the event.

On the surface, such event scheduling processes may appear to be simply a matter of matching availabilities of those involved. But before it is possible to find a suitable time, poll initiators and participants have to make a range of decisions.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

CSCW'13, February 23–27, 2013, San Antonio, Texas, USA.

Copyright 2012 ACM 978-1-4503-1209-7/13/02...\$15.00.

What, for example, if participants do not make themselves available whenever they could in order to avoid making a temporary commitment for these times? What if they indicate availability for less convenient options just because they do not want to inhibit finding a mutually agreeable time? And what if they do so because of social norms and procedures that influence their behavior?

We see event scheduling as a group decision-making process [13] in which “a set of individual preferences are transformed into a group choice by a certain social procedure” [22]. Researchers have observed that societal norms and values differ between countries and determine how groups negotiate individual choices and reach consensus [12, 3, 7]. In countries that are believed to have collectivist and more community-oriented cultures, such as China or Japan, people see themselves as part of a group, and prefer collective decision-making with distributed responsibilities [31]. In individualist countries, as for example the US, people seem to be less concerned with harmony, and are less affected by the decisions of others [31].

Such variations in social procedures between countries lead to our main research question: Does (national) culture determine how we schedule events online?

To answer this question, we analyzed more than 1.5 million anonymized Doodle date/time polls, which had been initiated in 211 countries. Our findings empirically support several assumptions of cultural differences in group decision-making and time perception. For example, we found that in comparison to predominantly individualist societies, poll participants from collectivist countries respond earlier, agree to fewer options but find more consensus. More generally, our results demonstrate that Internet users have not converged into a homogeneous subcultural group with the same behavioral norms across the world, but that their use of technology considerably differs between countries. We discuss the implications of these findings for collaborative work within and across cultures, and suggest strategies for designing scheduling tools that raise awareness of cultural differences, or encourage behavioral change.

GROUPWARE CALENDARS AND EVENT SCHEDULING

Many of today's electronic calendar systems, such as Lotus Notes or Microsoft Outlook, provide a significant advantage

over their paper predecessors by allowing users to match their availabilities with others in order to schedule events. One of their downsides is that users need to ensure that all their plans are captured in their calendars. Moreover, they need to explicitly allow others to access their schedules [14] and by doing so, users automatically disclose personal availability patterns [24]. Although most systems enable users to hide any detailed information (e.g., the occasion of an event) researchers have raised concerns over people’s privacy [24]. Further, these systems do not capture users’ complex scheduling preferences [6], such as preferring afternoon meetings unless the meeting is with a boss or a colleague in a different time zone.

Online scheduling systems such as Doodle make a different trade-off: users disclose their availability in the context of a particular event, which allows them to keep their overall schedules private [24] and to make context-specific judgments about which times to make available for a particular activity. However, such systems impose additional work on all attendees and in some cases may create the expectation that the invitees will keep open all the times they reported as available until the results of the poll have been announced [35]. Thus, to remain in control of one’s own time, people have been found to “schedule defensively” [35], or in other words, to lie about their availabilities, and to manipulate the system for their own benefit [41]. By being very selective about one’s availabilities, participants could, for instance, influence the outcome of the scheduling process to suit their own preferences rather than attempting to find an option that maximizes the collective utility [41].

So far, much research has focused on inferring users’ complex preferences from past scheduling decisions [6] and on mechanisms for encouraging users to report their availabilities truthfully, for example by using game-theoretic mechanisms [13], or by employing an auction system [41]. Other studies looked at the use of calendars, and at social behaviors related to sharing availabilities [2]. Palen [35, 36] conducted a study of the use of groupware calendars at Sun Microsystems, and found that users were willing to share information about their availabilities if it benefited the scheduling process within their group. Geyer et al. [14] investigated the use of a social calendar that combined calendaring and microblogging within IBM. Similarly to Palen’s findings, they concluded that users were willing to share most of their availability information within the enterprise.

Our work has a different focus in that we examine the scheduling processes that emerge when people *do not* have to disclose their availabilities, as it is the case on Doodle. We extend related work by empirically investigating the social dynamics that are inherent in such group decision-making, and provide the first large-scale comparison of people’s scheduling behavior between multiple countries.

SCHEDULING EVENTS WITH DOODLE

Doodle date/time polls enable an initiator to find the best time for an event, by defining a poll that lists all viable *options*.

Participants make *choices* by selecting those options that are consistent with their availability and preferences. Underneath

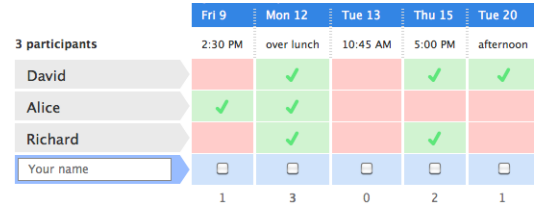


Figure 1. An example of a Doodle date/time poll, where the second option reached consensus among all three participants.

a poll, Doodle provides a summary of how many participants have selected each option, and highlights those that currently represent the majority vote. In Figure 1, for example, all three participants indicated availability over lunch on “Mon 12”, so this option received *consensus* among all participants. Date/time polls also allow initiators to define optional settings, such as enabling an *if-need-be* choice (instead of just *yes* or *no*) or using a *hidden poll*, where participants cannot see each other’s answers.

HYPOTHESES

Like other group decision-making processes, event scheduling follows certain “social procedures” [22]. It starts with specific choices made by an initiator (“Which times suit me best? Do I want participants to see each others’ answers?”) and is then passed on to individual decisions of participants (“When am I available? Should I disclose a less convenient time?”). However, instead of making our decisions independently, we usually look at the choices of others and consider how our own choice might affect the group outcome, or our standing within this group (“What have others chosen? What will they think of me if I make this choice?”).

Because social procedures are formed by cultural values, we assume that both the individual decisions, as well as the social dynamics found in the overall group decision-making process will be different between countries. Indeed, previous research suggests that people’s thinking, behavior, and preferences are formed by cultural influences [23] stemming from the language we speak, our religion, education, social and political norms, and values [26]. With that, culture becomes a “rich complex of meanings, beliefs, practices, symbols, norms, and values prevalent among people in a society” [37]—making it an intangible construct that does not allow easy comparison. No two people can possibly have exactly the same culture, but cultural groups often share similar thinking and behavior. Research on decision-making theory has contrasted such behavioral tendencies between countries (e.g., [1, 31]) and, thus, compared behavioral trends between *national cultures* [19].

To facilitate these comparisons, cultural anthropologists attempted to describe culture with a definite set of constructs, so-called cultural dimensions. Hall [15, 16], for example, proposed to differentiate cultures by their polychronic versus monochronic time orientation. He suggested that in countries that are predominantly polychronic (e.g., in China), human interactions are more important than time and this is often expressed by a much more relaxed attitude when needing to “get things done”. On the contrary, predominantly monochronic countries (e.g., Germany) show a greater concern for time management, including advance planning and punctuality. Monochronic cultures are thought to be on clock

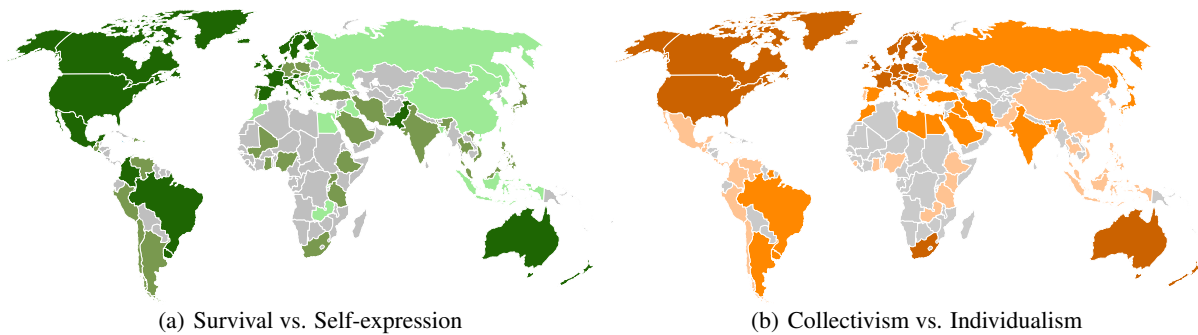


Figure 2. Overview of Inglehart’s Survival/Self-expression values (a) and Hofstede’s Individualism dimension (b). Darker colors stand for a higher Self-expression or Individualism score, respectively. Medium colors indicate scores ± 0.5 of the medium Survival/Self-expression, or ± 10 of the world average score (43) for Individualism. Gray areas mark countries that have not been included in Inglehart’s or Hofstede’s study.

time; in their life, an external clock dictates the start and end of events [28]. Polychronic cultures schedule their life more loosely around event time, where activities determine the course of the day, and multiple activities can take place at the same time [28]. Ending a discussion simply because another meeting is scheduled to start would be out of question for cultures on event time. Monochronic cultures can clash with this understanding, as they would expect punctuality and adherence to previously assigned schedules.

Differences in time perception have also been attributed to the extent to which people think of themselves as autonomous individuals with an interest in self-expression and a high quality of life that industrialization brought with it, in comparison to seeing themselves more as interdependent parts of a group, such as the family [38]. The phenomenon is usually described as Individualism versus Collectivism [38, 19], or Self-expression versus Survival [20].

Hofstede’s Individualism/Collectivism dimension is one of five that emerged from a large-scale quantitative study at IBM in 74 countries [18]. All countries in his study received a score on each of the five dimensions, facilitating comparisons between their national cultures. Hofstede’s study is older than the Self-expression/Survival scores of Inglehart [20], but the link between his Individualism scores and several behavioral phenomena has been well-explored, such as to measure variances in decision-making styles. Moreover, they have been explicitly linked to societies’ concern with time, making it an interesting construct for our study to relate to.

Inglehart’s Self-expression/Survival dimension emerged within the scope of the World Value Survey [40], which aims to track social and political changes with the help of country scores that have been collected in five waves of surveys, from 1981 to 2007. Thus, the scores for this dimension are arguably more up-to-date, the survey studies a broader population, and offers comparison between slightly more countries. To our knowledge, however, it has not been investigated in the context of decision-making, or directly linked to the perception of time. While the Individualism and Self-expression constructs slightly differ in their meaning, the country scores of both dimensions significantly correlate with each other [20]. In Hofstede’s

study, the US is the most individualist country with a score of 91, and Guatemala is “most collectivist” with a score of 6. Inglehart’s Survival/Self-expression dimension ranges from -2 to around 2.5, with many Scandinavian countries being high on Self-expression and Russia, Bulgaria, or the Ukraine having one of the lowest positions on the Survival/Self-expression value axis. Figure 2 shows a world overview of countries that are believed to score higher in self-expression versus survival based on the latest scores of the world value survey [40], and which ones are more individualist or more collectivist based on Hofstede’s country scores [18, 19]. We include both dimensions in our analysis to see how useful the Survival/Self-expression value is as a predictor for cultural differences in decision-making and time perception. As we will later see, both dimensions explain these cultural variations similarly well, and in combination, they help to explain some of the outliers that we see in our data.

Comparisons of national cultures always run the risk of stereotyping all people within one country [32], and thus, these kind of studies have to be seen as contrasting behavioral tendencies. This is especially interesting in our case, because Doodle users likely share a certain *subculture*, making the comparison of national cultures more meaningful [37]. Because Doodle users use the Internet, they are likely more educated and younger than the average person [34]. If we presume that Doodle users have a comparable subculture—thus, controlling for these factors—then differences in the scheduling behavior between countries are likely due to the influence of other cultural values.

Time Perception, Pace of Life, and Affluence

Doodle enhances efficiency by reducing the time required to schedule an event. We assume that Doodle users are primarily from those cultures that are highly concerned with time, which has been linked to Individualism [38]. Highly individualist societies (marked with a darker color in Figure 2(b)) are believed to emphasize individual achievements, and to feel a greater need to save time [27]. Similarly, time is used to structure days in monochronic cultures such as Germany, Switzerland, United States, and Scandinavia much more than in polychronic cultures (e.g., Egypt, Mexico, or India). We therefore hypothesize that individualist societies use Doodle more often than collectivist societies, and will compare the

results with Hall’s polychronic versus monochronic time orientation [15].

[H.1.1] The number of polls per internet user positively correlates with Individualism.

Researchers have also argued that some countries are more individualist than others because of their higher affluence [38]. Economic development has been attributed as a cause for cultural change, leading to a higher demand for self-expression [20]. If our first hypothesis is in fact true, then the number of polls should increase with a country’s per capita gross domestic product (GDP):

[H.1.2] The number of polls per internet user positively correlates with the GDP per capita.

Additionally, we assume that people use Doodle with a higher frequency in countries with a higher tempo. Levine and Norenzayan [27] compared people’s walking speed, the work speed amongst postal clerks, and the accuracy of bank clocks in 31 countries. Their study resulted in a ranking for each of these indicators, as well as in an overall pace of life index, with the fastest countries being in Western Europe and Japan, and the slowest in countries with less vital economies. We assume that the arithmetic means of each country’s pace of life, as they are provided by Levine and Norenzayan, parallels how often people use Doodle:

[H.1.3] The number of polls per internet user correlates with the pace of life country ranking.

Planning Ahead, Punctuality, and Response Time

Time is often mentioned as the most striking difference between cultures that divides the world into notorious planners and those who spontaneously get together. Countries with a fast pace of life and a high Individualism are generally thought to be monochronic, and on clock time [28]. People in these countries place more importance on time management and planning [25, 38], but might be less spontaneous and plan their events more in advance:

[H.2.1] People in individualist countries initiate Doodle polls further ahead of time than do collectivist countries.

The importance of time goes in line with expectations on punctuality [4, 15, 39]. We assume that people specify the time of a meeting option more precisely in individualist societies in which people live by clock time [28]. Defining a poll option as 11:15 a.m. indicates a higher level of precision than simply clock face time, and presumably, a higher expectation of punctuality. A date with a text string, e.g., “afternoon”, or “sometime in the evening”, is less precise than 11 a.m., but more precise than just a date.

[H.2.2] Countries with a higher Individualism use the time option for scheduling meetings more precisely.

Culture also influences whether we feel the need to optimize time [5]. In individualist societies, where “time is money”, people feel the need to speed up negotiation processes and decisions in general [30]. We could therefore assume that participants from countries with a high score in Individualism respond to polls more quickly than collectivist participants. On

the other hand, individualists, for whom time is often more important than human interactions [15], might be strategizing more by deferring a commitment to specific options as long as possible. If they respond to a poll too early, their time choices might be already outdated before the poll initiator informs of the final choice. However, if participants defer the decision, other time constraints will already be known, therefore facilitating the decision without a long-term commitment of their time. Hence, we put forward a non-directional hypothesis:

[H.2.3] The average response time per country correlates with the dimension Individualism.

Consensus and Dependency of Choices

The notion of “social proof” [9] describes the human tendency to follow other people’s decisions and choices. Social proof is assumed to be more prevalent in collectivist countries (e.g., Taiwan, China, or Japan), where people have a greater desire for harmony and blending in [1]. This also parallels a higher reluctance of people in collectivist cultures to independently make decisions [31]: Study participants from Japan, Hong Kong, and Taiwan reported a higher preference for collective decisions—thus, sharing responsibility—and a higher tendency to completely hand over responsibility to an authority [31]. People in individualist countries show a different decision-making behavior, sometimes driven by the desire to be unique [1]. They report a greater confidence in their own decision-making ability, and make choices more independently of others [31].

Such autonomous decision-making has been linked to high self-expression values [20]. Society’s economic success usually changes the political climate in favor of an increasing demand for democratic rights [21]. The emerging emphasis on independent choices in more democratic countries might be mirrored in people’s scheduling behavior: Doodle users from highly economically viable countries and with high self-expression scores might insist on their democratic right to vote independently, and thus, pay less attention to the choices of others. In contrast, Doodle users from community-oriented, collectivist countries might try harder to match the decision of others, and to find mutual agreement.

We assume that the number of options that reach consensus within a poll is higher in collectivist countries, and the same should be true for the Survival/Self-expression dimension. We define “consensus” as reaching agreement among all participants, but not necessarily on all options.

[H.3.1] The fraction of options that reach consensus within open polls negatively correlates with Individualism.

According to the social proof theory, the decision outcome can be substantially influenced if the preferences of others are visible [9]. In particular, we hypothesize that participants have the goal to find mutual agreement, and that they will therefore adjust their availabilities to find more consensus options. The hidden polls in our data set provide us with a convenient baseline: If participants cannot see each other’s choices, any influence of this sort can be ruled out. In our analysis, we will therefore also contrast the assumption of the previous hypothesis with hidden polls versus open polls:

[H.3.2] *The fraction of options that reach consensus is higher in open polls than in hidden polls.*

According to the findings of Mann et al. [31], we further assume that participants from collectivist countries with more group-oriented cultures tend to “pass the buck”, meaning that they avoid making decisions themselves. Furthermore, collectivists have a stronger desire to comply with others [1]. This could result in a corresponding avoidance of declining an option in a poll:

[H.3.3] *The fraction of options that participants agree to within open polls negatively correlates with Individualism.*

Correspondingly, we assume that participants from collectivist countries prefer declining an option less decisively. We assume that participants from group-oriented collectivist countries select *if-need-be* more often than participants from individualist countries:

[H.3.4] *The fraction of times that people select “if-need-be” negatively correlates with Individualism.*

DATA PREPARATION AND ANALYSIS

We analyzed 1,771,430 anonymized date/time polls provided to us by Doodle. The polls were selected at random from a time period in mid-2011 and an additional time period in early 2012. Both sets of polls showed consistent results, so the following analyses report on the merged data set. As part of the data preparation, we excluded polls that did not have any participant responses. Our final data set contains 1,536,022 polls initiated by users from 211 countries¹ ($m = 9.14$, $sd = 58.2$ polls per country). On average, these polls have 5 participants ($sd = 1.4$) and 13.5 options ($sd = 15.2$).

Correlations between two variables were analyzed with Spearman’s r (two-tailed) given that our data was significantly non-normal (Kolmogorov-Smirnov tests showing $p < .05$ for all variables). P-values were adjusted for multiple hypothesis testing using the Benjamini-Hochberg correction. We compared two dependent conditions (e.g., the difference between hidden and open polls) using the Wilcoxon signed-rank test, and several independent conditions (e.g., the countries) with the Kruskal-Wallis test.

The correlation analyses report on a subset of the 211 countries: First, when relating to the dimension Individualism, we employ the scores from Hofstede’s study [18], which were available for 76 of the countries in our data set. Levine’s study on the pace of life [27] comprised timing data for 31 countries, all of which were also included in our data set. In addition, we used the Survival/Self-expression scores of 68 of the countries included in the World Value Survey [40].

In favor of higher validity, the subset of countries was further reduced when we evaluated behavior on a poll or participant level. The advance planning and response time was analyzed for a subset of 828,560 polls and 177 countries for which we were able to retrieve the poll initiation time stamps. Our correlation analyses are based on 47 of these countries that

¹Countries were automatically derived from IP addresses with the help of the Maxmind GeoIP database. IP addresses were not revealed to the researchers at any time.

have an Individualism score, and 50 that have a Survival/Self-Expression score. To evaluate the hypotheses related to consensus (H.3.*), we used 52 countries that had more than 100 polls and at least 5 hidden polls. Lastly, the analysis for H.3.4. compares 37 countries that have used the “if-need-be” option, received an Individualism score and had at least 50 polls.

For the calculation of the advance planning time, we computed the average time difference per country between the poll initiation time stamp and the time given for the first option. For polls that only specified a date, or date and text (e.g., morning, or afternoon), we used midday as the time of the first option. The average response time per country was calculated by subtracting the average of participants’ response times per poll from the poll initiation time stamp. Finally, the number of polls that reach consensus within a country was calculated by taking into account polls where participants found mutual agreement for at least one option divided by the overall number of polls per country.

To mitigate the influence of population size and internet penetration, we calculated the *number of polls per capita* and the *number of polls per internet users*. Population data and information about each country’s per capita gross domestic product (GDP, available for 205 countries) was derived from [8] and supplemented with information from [33].

Variables such as consensus options were normalized based on the *number of options per poll*. For comparisons between countries, we further adjusted our data for the *number of polls per country*.

RESULTS

All hypotheses and their results are summarized in Table 1.

[H.1.1] Our results support the hypothesis that the higher a country’s Individualism score, the more likely its people are to schedule events with Doodle. As Table 2 shows, it is mostly Western countries that lead the list of Doodle users. These countries are regarded as monochronic cultures that use time to structure days much more than predominantly polychronic cultures. All countries in the left column are highly individualist cultures, but the right column shows some outliers: Singapore has a score of 20, clearly marking it as a collectivist country. Lebanon and Hong Kong are regarded as collectivist societies with a score of 38 and 25, respectively. Bermuda and Cambodia were not included in Hofstede’s study, but both can be assumed to predominantly show collectivist traits. There could be multiple reasons that these countries are showing a comparatively high scheduling activity: Singapore and Hong Kong are both examples of huge economic growth. Bermuda is a tax haven and it could well be that Doodle is being used by the many expats living in the country. The high scheduling activity could, however, also be the result of changing work practices in these countries.

The neighboring countries Liechtenstein and Switzerland are much more likely to schedule events with Doodle than any other country in our data set, which could be partly attributed to the fact that Doodle is a Swiss company. Doodle’s uptake was highly supported by word-of-mouth communication, which suggests that its adoption rate might be higher

Time Perception, Pace of Life, and Affluence		
H.1.1	The number of polls per internet user and country positively correlates with Individualism.	$r_{s(74)} = .65, p < .001$
H.1.2	The number of polls per internet user and country positively correlates with the GDP per capita.	$r_{s(203)} = .57, p < .001$
H.1.3	The number of polls per internet user correlates with the pace of life country ranking.	$r_{s(29)} = -.67, p < .001$
Planning Ahead, Punctuality, and Response Time		
H.2.1	People in individualist countries initiate Doodle polls further ahead of time than do collectivist countries.	$r_{s(45)} = .60, p < .001$
H.2.2	Countries with a higher Individualism use the time option for scheduling meetings more precisely.	partly supported: $r_{s(56)} = .31, p < .05$
H.2.3	The average response time per country correlates with Individualism.	$r_{s(45)} = .50, p < .001$
Consensus and Dependency of Choices		
H.3.1	The fraction of options that reach consensus within open polls negatively correlates with Individualism.	$r_{s(50)} = -.32, p < .05$
H.3.2	The fraction of options that reach consensus is higher in open polls than in hidden polls.	$Z_{(58)} = -6.53,$ $p < .001, r = -.86$
H.3.3	The fraction of options that participants agree to within open polls negatively correlates with Individualism.	Inverted: $r_{s(50)} = .62, p < .001$
H.3.4	The fraction of times that people select “if-need-be” negatively correlates with Individualism.	$r_{s(35)} = -.31, p < .1$

Table 1. Summary of the hypotheses and results. P-values were adjusted for multiple hypothesis testing using the Benjamini-Hochberg correction.

in neighboring countries and those with similar languages. However, even when excluding Switzerland from the analysis², the relationship between Individualism and the number of polls remains strong, $r_{s(73)} = .64, p < .001$.

Country	# of polls	per k Internet users	Country	# of polls	per k Internet users
Liechtenstein	2,540	110.430	United Kingdom	60,686	1.180
Switzerland	358,108	58.210	France	53,131	1.174
Austria	47,721	7.768	Bermuda	53	0.982
Germany	405,381	6.225	Sweden	7,963	0.948
Belgium	45,309	5.585	Malta	195	0.811
Luxembourg	1,788	4.212	Israel	3,426	0.757
Denmark	15,774	3.321	New Zealand	2,507	0.737
Canada	81,129	3.009	Singapore	2,372	0.733
USA	602,419	2.459	Netherlands	9,815	0.660
Iceland	679	2.311	Lebanon	596	0.596
Estonia	2,162	2.225	Cambodia	45	0.573
Norway	9,157	2.067	Hong Kong	2,570	0.527
Finland	8,921	2.031	Hungary	3,238	0.524
Ireland	4,161	1.367	Australia	7,321	0.463

Table 2. The 28 countries with the highest numbers of polls per thousand Internet users, and their number of polls in our data set.

[H.1.2] In line with the previous discussion on the link between scheduling activity and economic growth, we had hypothesized that the number of polls per Internet user and country correlates with the GDP per capita. Those countries with a higher affluence do indeed show more scheduling activity on Doodle, confirming H.1.2. The result also indicates that Doodle use might be a function of the amount of white-collar work in these countries with stronger economies, which usually leads to a greater need for scheduling.

[H.1.3] The number of polls per internet user and country also significantly correlates with Levine and Norenzayan’s pace of life study. We found correlations with walking speed ($r_{s(29)} = -.56, p < .001$), postal speed ($r_{s(29)} = -.56, p < .001$), and clock accuracy ($r_{s(29)} = -.47, p < .01$). Thus, the faster a country’s pace of life (represented by a smaller

number of seconds), the higher the number of polls per Internet user. If the data is normalized instead by population size (i.e., number of polls per capita), we see the same significance. We can therefore confirm Hypotheses 1.1, 1.2, and 1.3 even when not accounting for the effect of Internet penetration. Altogether, our first set of results suggests that Internet users use Doodle with a higher frequency if they come from individualist countries with high economic viability, and a fast pace of life.

[H.2.1] In support of Hypothesis 2.1 we found that Doodle users from countries with a high Individualism plan further in advance. Figure 3 provides an overview of the advance planning times in relation to the countries’ Individualism scores. There are a few outliers. Mexico, a country that is often regarded as having a laid-back, event-time culture, follows Switzerland and Germany with a high advance planning time of 28 days. In the Survival/Self-expression dimension, Mexicans have transitioned from a culture of “survival” towards a self-expression score of 1.03 over the last 10 years. In comparison, Germany has a lower self-expression score of 0.44 (West) and 0.42 (East), while Switzerland has a higher self-expression score of 1.90. Inglehart relates changes from survival to more self-expression as Mexico has experienced it to an increasing economic development and industrialization—in which time becomes more important. While the importance of time in societies with a higher self-expression has previously only been hypothesized, our data demonstrates that the dimension can be indeed a good predictor of advance scheduling time ($r_{s(48)} = -.67, p < .001$).

This also shows in another outlier: Hungary only plans ahead 13.7 days, yet with an Individualism score of 80 is regarded as a highly individualist country. Again, the low score of -1.22 in the Survival/Self-Expression dimension might be more suitable to explain the result. Lastly, American Doodle users schedule much more spontaneously (on average 17 days in advance) than their high Individualism score of 91, as well as their high Self-Expression score of 1.76 would suggest. This is very comparable to Thailand, China, Singapore, who plan between 15 and 18 days in advance, yet whose national cultures are usually thought to be strongly collectivist.

²Liechtenstein was not included in Hofstede’s original study, and is therefore not part of our analyses involving Hofstede’s scores.

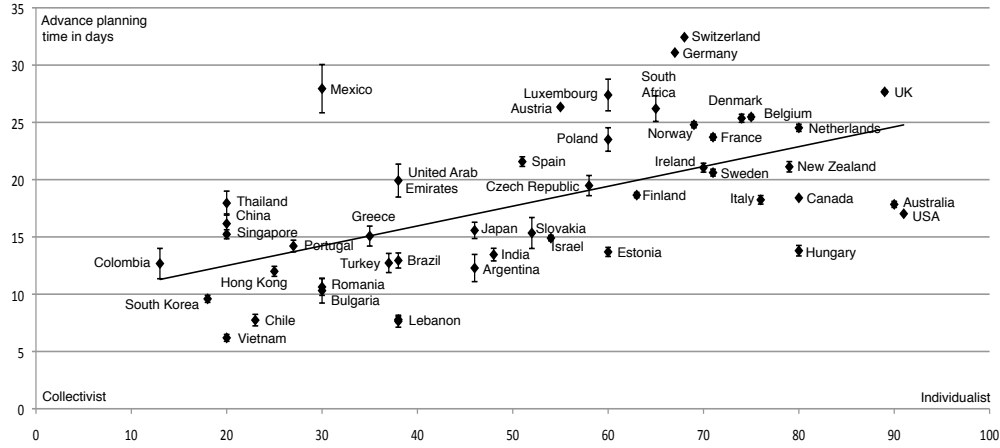


Figure 3. Average advance planning times in days in relation to Individualism scores. Error bars represent the standard error within one country.

[H.2.2] We also assumed that in countries with a higher individualism options might be specified with more detail, a hypothesis that was confirmed for polls with options defined at the 5-minute precision level (e.g., 4:35 p.m.). Individualist countries schedule their events more often with a precision of 5 minutes. The correlation was also confirmed for the Survival/Self-expression values ($r_{s(52)} = .34, p < .01$).

Interestingly, we cannot substantiate this hypothesis for polls with options at a 10 or 15 minute precision level. It is likely that the overall number of these polls in our data set is too low to fully verify a relationship between Individualism and precision level. In fact, only 2% of the polls contained options that had been defined with a 5 minute precision, 10 minute precision, or a 15 minute precision. In contrast, the plurality of polls (41%) has their option time set to the full hour.

[H.2.3] The average response time across all polls per country significantly correlates with the dimension Individualism, therefore substantiating Hypothesis 2.3. Participants in countries with a higher individualism tend to provide their choices *later* than participants of collectivist countries. A strong correlation with the Survival/Self-expression values ($r_{s(48)} = .67, p < .001$) confirms this result.

The finding can be partly attributed to the fact that countries high in individualism and self-expression plan much more in advance, as we have shown in H.2.1. Countries like Switzerland and Germany, who plan their events longest in advance, are now the ones that take longest to respond—on average 44.1 and 45.1 hours after the poll was set up. This is in contrast to Bulgaria, South Korea, Lebanon, and Vietnam with respond times ranging between 14.1 and 18.6 hours (Bulgaria being the fastest). However, even when controlling for the advance planning time, Individualism remains a strong predictor for longer response times (multiple regression, $F_{(2,73)} = 12.11, p < .001, adj.r^2 = .23$).

The cause for this is likely to be a function of individualists' least-commitment behavior. By responding late, individualists seem to defer making time commitments, perhaps because an early response requires blocking time in their cal-

endar longer. Such least-commitment behavior in individualist countries strategically maximizes personal benefit, which collectivists tend to be opposed to [19].

A notable outlier in the correlation of response time with Individualism is China ($m = 40, sd = 3.6$ hours), whose participants respond similarly late as the UK and Luxembourg, yet China is thought to have a strong collectivist culture. We believe that this demonstrates where cultural dimensions alone cannot explain the variance in behavior that we are observing in our data. First of all, China has recently experienced enormous economic growth, probably resulting in a shift towards individualism. China is also classified as low on the Survival/Self-expression dimension, but Inglehart acknowledges that growing economies can be expected to result in a country's shift towards higher self-expression [21]. What we see in our data might therefore reflect "the emergence of a prosperous, educated, and self-confident middle-class" [21] that weakens the traditional values of Confucian culture. Chinese Doodle users might belong to a growing sub-cultural group that relates less to the Confucian subjectivity of time, but instead adopted a more Western time perception. This subcultural group within China could possibly become more prone to the least-commitment behavior.

Interestingly, participants respond significantly faster to open polls ($m = 35.6, sd = 6$ hours) than to hidden polls ($m = 45.4, sd = 15.8$ hours), $Z_{(17)} = -2.68, p < .01, r = .42$.³ In hidden polls, they have the opportunity to wait before committing to block certain times in their calendars without other participants noticing. In open polls, however, people might be well aware of the fact that the first participants often strongly influence the outcome of the poll, and thus, are eager to state their availabilities earlier.

[H.3.1] The fraction of options that reach consensus negatively correlates with Individualism, supporting Hypothesis 3.1. Collectivist countries find on average more consensus than individualists. However, some countries agree on significantly more options than others, sometimes independent of what their Individualism score would predict. In India, an

³This analysis used only countries with more than 20 hidden polls.

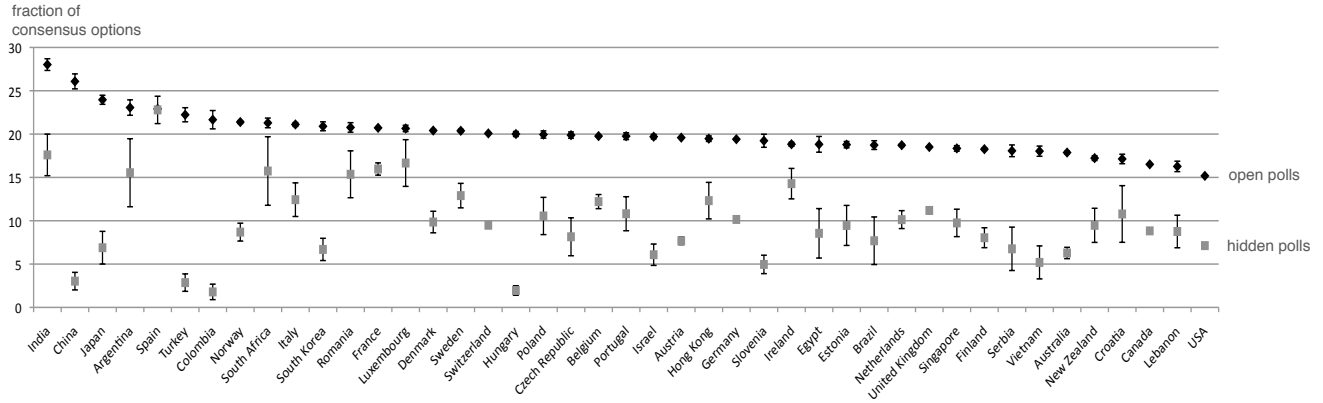


Figure 4. The average fraction of consensus options per country in open polls and hidden polls. Error bars show the standard error.

average of 28% of options find mutual agreement. As Figure 4 shows, this is the highest number in our data set and a strong contrast to the US, whose Doodle users only find consensus on an average of 15% of options. India is regarded as a collectivist country in which individual's actions are highly influenced by other's opinions. Its Individualism score of 48 seems to underestimate how much its people are willing to adjust their availabilities in order to find mutual agreement.

The countries with the second and third most consensus options are China and Japan (with 26% and 24%, respectively). Both are collectivist societies by Western standards, but China has a much stronger extended family system, which forms the basis of most collectivist societies. In contrast, Japan is usually regarded to deviate from other Asian cultures, but its collectivist values seem to remain influential: Seeking consensus can be interpreted as an active effort to keep harmony—a characteristic usually associated with collectivist cultures. In fact, Japan's high fraction of consensus options in our Doodle data verifies the findings of Mann et al. [31] who had found that Japanese participants preferred to collectively make decisions.

[H.3.2] According to the findings of our last hypothesis, people are rethinking their availabilities in an effort to find a mutually agreeable time—but they are not able to do this in hidden polls. In support of H.3.2, we found a significant difference between the fraction of options that reach consensus between hidden and open polls (see Table 1). Open polls reach almost double as many consensus options ($m = 20.3\%$ options, $sd = 2.5\%$) than hidden polls ($m = 11.2\%$, $sd = 5.7\%$). This demonstrates that people are indeed highly influenced by the choices of other poll participants and are actively trying to find mutual agreement.

Figure 4 shows that the fraction of consensus options reached in hidden polls highly differs between countries. This is due to how many availabilities participants offer in general (as discussed in the results of the next hypothesis). However, the difference between the fraction of consensus options in open and hidden polls can also be regarded as the amount of effort that people put in to reach consensus in open polls, compared to the “baseline” hidden polls, in which they cannot see other's choices. This difference is largest for the collectivist

countries China and Colombia, suggesting that these countries put a higher effort into finding mutual consensus.

[H.3.3] Individualism significantly correlates with the fraction of options that participants agree to. Contrary to our hypothesis, however, participants with a higher Individualism score show *more* availabilities. As might be expected, the fraction of availabilities slightly increases the further ahead of the actual event the poll was set up. However, even when controlling for the planning ahead time and the number of options (which could potentially confound the fraction of times that people are willing to commit to), the relationship remains positive and significant (multiple regression, $F_{(2,48)} = 18.72, p < .001, adj.r^2 = .41$).

Collectivists show less availabilities, yet in our analysis of Hypothesis 3.1 we found that they find more consensus options. Both findings in combination indicate that collectivists must be explicitly targeting their few availabilities at those options that are likely to reach consensus.

The correlation between the fraction of options that participants agree to and Individualism also remains true in hidden polls ($r_{s(51)} = .32, p < .05$), albeit in a weaker form. Moreover, participants agree to a significantly larger fraction of options in open polls ($m = 53.7\%$ availabilities, $sd = 3.8\%$) than in hidden polls ($m = 39.6\%$ availabilities, $sd = 10.9\%$), $Z_{(59)} = -6.38, p < .001, r = -.83$. Iceland, Lithuania, Slovakia, Philippines, Taiwan, and Serbia show the greatest change in behavior when using hidden polls by reducing their availabilities by a factor of 3.

[H.3.4] The fraction of if-need-be answers show a weak inverse relationship with Individualism, suggesting that collectivists answer with “if-need-be” slightly more often. The correlation is significant with the Survival/Self-expression dimension ($r_{s(50)} = -.52, p < .001$), indicating that these values are more predictive of a country's tendency to use if-need-be. The countries that answer if-need-be most often are Hungary, Slovenia, Latvia, Russia, Czech Republic, and China with 13% to 14.7%. With the exception of Slovenia and the Czech Republic, all of these countries rank low on the Survival/Self-expression dimension, but not all of them are regarded as collectivist cultures. Hungary and the Czech

Republic, for example, received Individualism scores of 80 and 58, respectively. In contrast, Liechtenstein, Switzerland, Luxembourg and France, countries that rank high in self-expression and Individualism, use if-need-be least often (7.6-9.1%). The relationship with Survival/Self-expression remains equally strong when regarding if-need-be answers as a resort to declining an option ($r_{s(50)} = -.57, p < .001$).

DISCUSSION

When discussing the effect of technology on culture, people often assume that the world is slowly homogenizing into a culture of Internet users, who share similar values and behavioral norms [29, 17]. Our analysis of the online scheduling behavior on Doodle argues against this hypothesis.

In fact, Doodle users around the world use the tool very differently: Our data indicates that individualists strategically respond late, perhaps in order to make fewer time commitments and maximize their own flexibility [35, 41]. Our results also demonstrate that across the world, people are steering their availabilities towards those options that have good chances to reach consensus, which shows in a significantly higher number of consensus options in open polls compared to hidden polls. But collectivists seem to make a larger effort to reach mutual agreement: Polls initiated in collectivist countries find more consensus options, while their participants indicate fewer availabilities. This is consistent with previous findings in the decision-making literature: Collectivists are more likely to conform to other people's decisions and choices [1, 31]. However, the finding also implies that collectivist participants must predominantly show availabilities for those options that have a good chance of finding consensus. Individualists show more availabilities, but seem to agree to options despite knowing that these will not reach consensus. One possible interpretation is that they want to appear flexible and willing to find consensus, while hoping to change the poll outcome to their preferred option [13, 35, 41].

Such differences in scheduling behavior can lead to misinterpretations of other's behavior and challenges in intercultural collaboration [4]. For example, if collectivists schedule more spontaneously, individualist participants might feel that showing availability close to the actual event could indicate to others that they are not as busy as they would like to appear. Conversely, if individualists set up polls a long time in advance, collectivists might expect a higher importance of the event when it may not be.

Likewise, differences in expectations towards people's response time can cause friction. Collectivists might see a late response as unsocial behavior: They are blocking time in their calendar while other participants seem to perceive their own time as more important.

Furthermore, if collectivists show less availabilities, individualists could understand this as a lower willingness to find consensus. Collectivists, on the other hand, might have a higher expectation that poll participants adjust their availabilities for the benefit of the group and that they confirm options that will likely reach consensus. Thus, a rejection of these leading options might be perceived as selfish behavior in more group-oriented cultures.

To mitigate similar misunderstandings, intercultural training usually focuses on raising awareness about cultural differences, as well as on suggesting behavioral adjustments [4]. A combination of both could also facilitate scheduling within and across cultures: One possibility to invoke a certain response behavior, for example, would be to set a deadline by which participants have to respond to polls. This has the positive side effect of removing the penalty for participants that respond quickly—those participants no longer have to keep all options they agreed to open. To increase chances of finding a mutually agreeable time, scheduling systems could also emphasize options that are likely to reach consensus, or explicitly notify a participant when s/he declines options that otherwise suited everyone. Notifications could supplement Doodle's current display of majority vote(s), but would more directly point out which choice(s) inhibit finding consensus.

Intercultural training additionally suggests to raise awareness of ethnocentric or culturally insensitive behaviors, and to provide people with the appropriate knowledge of cultural differences [4]. Scheduling systems could do so by displaying informational tool-tips and providing feedback (as suggested in [10]). This information could already support the poll setup. In some countries, for example, we have seen longer response times, or that people showed less availabilities when using hidden polls. Depending on the poll initiator's country (e.g., as indicated by her IP address), scheduling systems could inform about these likely behaviors. Moreover, the system could guide the poll setup by providing advice on optional settings, such as the pros and cons of hidden versus open polls, or when a deadline option might be appropriate. If a poll is likely to include participants from several different countries (e.g., if the initiator turns on time zone support), scheduling systems could more generally inform poll initiators about scheduling differences between cultures.

Similar information could also be useful for participants: Scheduling systems could automatically detect whether people's IP addresses suggest a multinational team, and inform about possible differences in other participants' scheduling behavior. Our findings can serve as a basis for these explanations, and help mitigate possible misunderstandings in intercultural scheduling.

LIMITATIONS, FUTURE WORK AND CONCLUSION

The results of this paper confirm our research question: Culture influences how we schedule events online. In comparison to individualist societies, such as the US, more group-oriented collectivist countries respond to polls earlier, indicate fewer availabilities, but seem to make a larger effort to reach mutual agreement. The results provide empirical evidence of these behavioral variations when people schedule online, and indicate possible reasons for misunderstandings when scheduling across cultures. We believe that increasing the awareness of these differences can help improve intercultural scheduling and support the acceptance of cultural differences as an interesting contribution to our lives.

Our analysis of Doodle date/time polls was an empirically powerful way to unobtrusively investigate such variations between countries, but it is obvious that future work needs to address several shortcomings. Specifically, we intend to follow

up our findings with interviews and surveys in order to ensure that the behavioral differences observed between countries are not the result of a varying use of Doodle. For example, the current data set did not provide us with any information about the purpose for which polls were scheduled, potential hierarchies between poll participants, or whether Doodle is mostly used to schedule work or leisure time activities in a specific country. Future work also needs to clarify whether the behavioral differences are the result of varying job sectors between countries rather than the influence of national culture. Last but not least, we would be delighted to see our results compared to, and complemented with, similar event scheduling data of international organizations or of another online event scheduling service.

ONLINE APPENDIX

To enable others to validate and extend our results, our data set containing information about all 211 countries can be downloaded from <http://iis.seas.harvard.edu/resources/>.

ACKNOWLEDGMENTS

We thank David Gubler from Doodle for helping with the data export, and Anthony Jameson for numerous discussions on decision-making and culture. Katharina Reinecke was supported by the Swiss National Science Foundation under fellowship number PBZHP2-135922.

REFERENCES

1. Aaker, J., and Maheswaran, D. The Effect of Cultural Orientation on Persuasion. *Journal of Consumer Research* 24 (1997), 315–328.
2. Birnholtz, J., Dixon, G., and Hancock, J. Distance, Ambiguity and Appropriation: Structures Affording Impression Management in a Collocated Organization. *Computers in Human Behavior* 28 (2012), 1028–1035.
3. Brew, F. P., Hesketh, B., and Taylor, A. Individualist-Collectivist Differences in Adolescent Decision Making and Decision Styles with Chinese and Anglos. *International Journal of Intercultural Relations* 25, 1 (2001), 1–19.
4. Brislin, R., and Yoshida, T. *Intercultural Communication Training: An Introduction*. Thousand Oaks, CA: Sage, 1994.
5. Brislin, R. W., and Kim, E. S. Cultural Diversity in People's Understanding and Uses of Time. *Applied Psychology* 52 (2003), 363–382.
6. Brzozowski, M. et al. groupTime: Preference Based Group Scheduling. In *Proc. CHI* (2006).
7. Choi, I., Choi, J. A., and Norenzayan, A. Culture and Decisions. *Blackwell Handbook on Judgment and Decision Making* (2004), 504–524.
8. CIA World Factbook. <https://www.cia.gov/library/publications/the-world-factbook>, last access: 08/07/2012.
9. Cialdini, R. The Science of Persuasion. *Scientific American* 284 (2001), 76–81.
10. Diamant, E. I., Fussell, S. R., and Lo, F. Where Did We Turn Wrong?: Unpacking the Effect of Culture and Technology on Attributions of Team Performance. In *Proc. CSCW'08* (2008), 383–392.
11. Doodle AG. <http://www.doodle.com>, last access: 07/08/2012.
12. El-Shinnaway, M., and Vinze, A. S. Technology, Culture and Persuasiveness: a Study of Choice-shifts in Group Settings. *International Journal of Human-Computer Studies* 47 (1997), 473–496.
13. Ephrati, E., Zlotkin, G., and Rosenschein, J. S. Meet your Destiny: A Non-Manipulable Meeting Scheduler. In *Proc. CSCW* (1994), 359–371.
14. Geyer, W., Dugan, C., and Brownholtz, B. An Open, Social Micro-calender for the Enterprise: Timely? In *Proc. CHI* (2011), 247–256.
15. Hall, E. T. *The Silent Language*. Anchor, 1973.
16. Hall, E. T. *The Dance of Life: The Other Dimension of Time*. Anchor; 1st edition, 1984.
17. Hamelink, C. J. New information and communication technologies, social development and cultural change. Tech. rep., United Nations Research Institute for Social Development, Geneva, Switzerland, 1997.
18. Hofstede, G. <http://www.geert-hofstede.com>, last access: 12/10/2011.
19. Hofstede, G. *Cultures and Organizations: Software of the Mind*. London: McGraw-Hill, 1997.
20. Inglehart, R., and Baker, W. E. Modernization, Cultural Change, and the Persistence of Traditional Values. *American sociological review* 65, 1 (2000), 19–51.
21. Inglehart, R., and Oyserman, D. *Individualism, Autonomy and Self-Expression: The Human Development Syndrome*. Leiden, The Netherlands: Brill, 2004, 74–96.
22. Kameda, T. Procedural Influence in Consensus Formation: Evaluating Group Decision Making from a Social Choice Perspective. In *Understanding Group Behavior: Consensual Action by Small Groups*. Erlbaum, 1996, 137–161.
23. Karahanna, E., Evaristo, R., and Srite, M. Levels of Culture and Individual Behavior: An Integrative Perspective. *Journal of Global Information Management* 13, 2 (2005), 1–20.
24. Kellermann, B., and Bohme, R. Privacy-Enhanced Event Scheduling. In *Proc. Computational Science and Engineering* (2009), 52–59.
25. Kirkcaldy, B., Furnham, A., and Levine, R. Attitudinal and Personality Correlates of a Nation's Pace of Life. *Journal of Managerial Psychology* 16, 1 (2001), 20–34.
26. Leidner, D. E., and Kayworth, T. A Review of Culture in Information Systems Research: Toward a Theory of Information Technology Culture Conflict. *Management Information Systems Quarterly* 30, 2 (2006), 357–399.
27. Levine, R., and Norenzayan, A. The Pace of Life in 31 Countries. *Journal of Cross-Cultural Psychology* 30, 2 (1999), 178–205.
28. Levine, R. V. *A Geography of Time: On Tempo, Culture, And the Pace of Life*. Basic Books, 1st edition, 1998.
29. Levitt, T. The globalization of markets. *Harvard Business Review* 61, 3 (1983), 92–102.
30. Macduff, I. Your Pace or Mine? Culture, Time, and Negotiation. *Negotiation Journal* 22, 1 (2006), 31–45.
31. Mann, L. et al. Cross-cultural Differences in Self-reported Decision-making Style and Confidence. *International Journal of Psychology* 33, 5 (1998), 325–335.
32. McSweeney, B. Hofstede's Model of National Cultural Differences and Their Consequences. *Human Relations* 55, 1 (2002), 89–118.
33. Miniwatts Marketing Group. <http://www.internetworldstats.com>, last access: 12/10/2011.
34. Nie, N. H., and Erbring, L. Internet and Society: A Preliminary Report. *IT & Society* 1, 1 (2002), 275–283.
35. Palen, L. A. *Calendars on the New Frontier: Challenges of Groupware Technology*. PhD thesis, University of California, Irvine, 1998.
36. Palen, L. A. Social, Individual and Technological Issues for Groupware Calendar Systems. In *Proc. CHI* (1999), 17–24.
37. Schwartz, S. H. Mapping and Interpreting Cultural Differences Around the World. *Int. Studies in Sociology and Social Anthropology* 93 (2004), 43–73.
38. Triandis, H. C. *Individualism and Collectivism*. Boulder, Co.: Westview, 1995.
39. White, L. T., Valk, R., and Dialmy, A. What is the meaning of "on time"? the sociocultural nature of standards of punctuality. *Journal of Cross-Cultural Psychology* 42, 3 (2011), 482–493.
40. World Values Survey Association, 2009. official aggregate v.20090901, 1981–2008.
41. Xu, C. Making Doodle Obsolete: Applying Auction Mechanisms to Meeting Scheduling. Bachelor's thesis, Harvard College, 2010.